



Figure 4.4. A representation of cell structure detail available in light versus electron micrographs. The center shows what can typically be seen with a light microscope, whereas the outer region reveals details of various organelles that could be seen in electron micrographs of the 1950s. Reprinted from E. D. P. De Robertis, W. W. Nowinski, and F. Saez (1960), *General Cytology* (Third ed.). Philadelphia: W. B. Saunders Company, Figure 3.9 on p. 71, with permission from Elsevier.

product of the number of atoms and their physical density or atomic number. In 1924, Louis de Broglie discovered the key theoretical concept on which electron microscopy depended, namely, that electrons have wave properties with wavelength inversely proportional to electron velocity. Two years later Hans Busch showed how to focus the electron beam by means of magnetic lenses. From these foundations, Max Knoll, Ernst Ruska, and Bodo von Borries developed transmission electron microscopes in the 1930s. In 1933 Ruska introduced the first true compound electron microscope, greatly increasing its resolving power. He then joined the firm of Siemens and Halske and, with